VNIVERSITAT DE VALÈNCIA

# Course Guide
# 43819 Energy management

## COURSE DATA

| Data Subject | |
|---|---|
| **Code** | 43819 |
| **Name** | Energy management |
| **Cycle** | Master's degree |
| **ECTS Credits** | 3.0 |
| **Academic year** | 2023 - 2024 |

**Study (s)**

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 2227 - M.U. en Ingeniería Ambiental | School of Engineering | 2 | First term |
| 2250 - M.D. in Environmental Engineering | School of Engineering | 2 | First term |

**Subject-matter**

| Degree | Subject-matter | Character |
|---|---|---|
| 2227 - M.U. en Ingeniería Ambiental | 6 - Optatividad para especialización | Optional |
| 2250 - M.D. in Environmental Engineering | 24 - Gestión energética | Optional |

**Coordination**

| Name | Department |
|---|---|
| LATORRE BELTRAN, JOSE VICENTE | 245 - Chemical Engineering |
| MARTINEZ SORIA, VICENTE | 245 - Chemical Engineering |

## SUMMARY

Energy Management is an optional subject of 3.0 ECTS that is taught in the first semester of the second year of the Master of Environmental Engineering. It aims to serve as an introduction to the knowledge and use of energy management instruments and renewable energy techniques available, analyzing it from an industrial point of view, especially in relation to the optimization of resource consumption, which is necessary to minimize the impact environmental of industrial production processes. This subject serves, together with other subjects of the degree, to complete the necessary training in relation to the reduction of polluting emissions and consumption of non-renewable resources that the professional of the area requires.

# PREVIOUS KNOWLEDGE

## Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

## Other requirements

No restrictions.

# OUTCOMES

## 2227 - M.U. en Ingeniería Ambiental

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Identify and apply technologies, tools and techniques in the field of environmental engineering.
- Assume with responsibility and ethics the Environmental Engineer role in a professional context.
- Promote and apply the principles of sustainability.
- Adapt to changes, being able to apply the principles of Environmental Engineering to unknown cases and use new and advanced technologies and other relevant developments, with initiative and entrepreneurial spirit.
- Design and calculate engineering solutions to environmental problems, comparing and selecting technical alternatives and identifying emerging technologies.
- Design and manage wastewater treatment and treatment systems for atmospheric emissions.
- Design and manage wastewater treatment systems.
- Design and operate systems for waste management and treatment.
- Design and manage treatment systems for contaminated soils.

**2250 - M.D. in Environmental Engineering**

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Identify, formulate and solve complex environmental engineering problems by applying engineering, scientific and mathematical principles.
- Recognise the ethical and professional responsibilities of environmental engineering and make informed judgements considering the impact of engineering solutions in global, economic, environmental and social contexts.
- Learn and apply new knowledge, using appropriate learning strategies.
- Implement measures for preventing pollution and recovering, protecting and improving environmental quality.
- Design, calculate and select engineering solutions to environmental problems, comparing alternatives that include emerging technologies under criteria of technical, social, economic and environmental viability.
- Apply tools for environmental assessment and management including environmental impact assessment and environmental risk assessment.
- Prepare and draft technical reports and/or environmental engineering projects considering technical, economic, social, energy and/or environmental aspects.
- Develop environmental solutions under the principles of circular economy and the sustainable development goals.

## LEARNING OUTCOMES

1 Understanding and critical analysis of the current situation of energy, and its impact on the industry.

2 Understand what is and what an energy audit consists of.

3 Be able to perform energy audits for simple cases

4 Know the energy saving techniques and determine their possible applicability.

5 Perform calculations of energy savings, including economic evaluation.

6 Know the characteristics of the different renewable energies: applications, environmental and economic aspects, their current situation and perspectives.

7 Know the technological and economic aspects associated with cogeneration

8. Know how to apply methodologies for energy integration of processes

## DESCRIPTION OF CONTENTS

### 1. Energy, Industry, Management and Environment

1.1 Current and energy perspectives. Consumption and energy costs.
1.2 Energy management and policies
1.3 Energy management tools and techniques.

### 2. Energy Audit

2.1 The role of the energy audit.
2.2 Energy data of the company: production process, consumption, costs, etc.
2.3 Comparative analysis: indicators, specific consumption of the sector, use of good practices, etc. Analysis of improvement opportunities.
2.4 Economic calculations: estimation of benefits.

### 3. Energy efficiency

3.1 Concept of energy saving.
3.2 Energy saving techniques: recycling, insulation, process analysis. More efficient electrical and thermal systems.
3.3 Process integration. Pinch Technology

### 4. Cogeneration

4.1 Concept. Benefits.
4.2 Types of systems: Gas turbine. Steam turbine. Alternative engine. Combined cycle.
4.3 Measurement of efficiency. Economic perspectives.

### 5. Renewable Energy Technologies

5.1 Concept and types.
5.2 Solar: thermal, thermoelectric, photovoltaic.
5.3 Wind.
5.4 Fuel cells.
5.5 Minihydraulics. Geothermal. Tides

### 6. Biomass and biofuel

6.1 Methods of converting Biomass into energy
6.2 Thermal processes (combustion, pyrolysis),
6.3 Biological Processes (alcoholic and methane fermentation: Biogas).
6.4 Biofuels: types.

## WORKLOAD

| ACTIVITY | Hours | % To be attended |
|---|---|---|
| Theory classes | 17,00 | 100 |
| Classroom practices | 10,00 | 100 |
| Theoretical and practical classes | 3,00 | 100 |
| Development of individual work | 10,00 | 0 |
| Study and independent work | 15,00 | 0 |
| Readings supplementary material | 5,00 | 0 |
| Preparation of evaluation activities | 5,00 | 0 |
| Preparing lectures | 5,00 | 0 |
| Preparation of practical classes and problem | 5,00 | 0 |
| **TOTAL** | **75,00** | |

## TEACHING METHODOLOGY

The training activities will be developed according to the following distribution:

• Theoretical activities.

Description: In the theoretical classes the topics will be developed providing a global and integrating vision, analyzing in greater detail the key aspects and of greater complexity, promoting, at all times, the participation of the student.

• Practical activities.

Description: They complement the theoretical activities with the aim of applying the basic concepts and expanding them with the knowledge and experience that they have, acquiring during the realization of the

proposed works. They comprise the following types of face-to-face activities:

• Classes of problems and questions in the classroom

• Discussion and problem solving sessions and exercises previously worked by the students

• Oral presentations

• Programmed tutoring (individualized or in groups)

• Work • Personal work of the student.

Description: Realization (outside the classroom) of monographic works, directed bibliographic search, issues and problems, as well as the preparation of classes and exams (study). This task will be carried out individually and tries to promote autonomous work.

• Evaluation.

Description: Realization of individual evaluation questionnaires in the classroom with the presence of the teacher.

The e-learning platform (Virtual Classroom of the Universitat de València and / or PoliformaT of the Polytechnic University of Valencia) will be used as a communication support with the students. Through it you will have access to the didactic material used in class, as well as the problems and exercises to solve.

## EVALUATION

63% of the overall mark will be obtained from the evaluation of the acquired knowledge, by means of the realization of a final exam. An additional 30% will be obtained through the completion and presentation of the proposed Works. 7% of overall mark will correspond to the evaluation of the resolution of proposed problems.

In any case, the evaluation system will be governed by the provisions of the Regulation of Appraisal and Qualification of the Universitat de València per a títols de Grau i Màster (http://links.uv.es/7S40pjF).

## REFERENCES

### Basic

- - Vicente Bermúdez Tamarit, Tecnología Energética. Universidad Politécnica de Valencia, 2000.
  - Manuales de energías renovables: Minicentrales hidroeléctricas, energía eólica, energía de la biomasa, incineración de residuos sólidos urbanos, energía solar térmica, energía solar fotovoltaica. Madrid: IDAE.
  - Manuales de Eficiencia Energética y Auditorias Energéticas del CADEN.
  - DOMÍNGUEZ GARRIDO, J. Energías renovables y medio ambiente. Universidad de Valladolid,

1994.
- La Energía en España 2007. Madrid 2007. Ministerio de Industria, Turismo y Comercio.
- Lujan J.M., Peidró J.L., y Guardiola C. Problemas de Tecnología y Gestión Energéticas. Universidad Politécnica de Valencia 2003.
- Molina Igartua, Luis Alfonso, "Manual de eficiencia energética térmica en la industria", Bilbao Ente Vasco de la Energía 1993

## Additional

- - M.J. MORAN y H.N. SHAPIRO Fundamentos de TERMODINÁMICA TÉCNICA. (2 TOMOS) Editorial Reverté, S.A., 1993.
- Manual de Auditorías Energéticas. Cámara Oficial de Comercio e Industria de Madrid y Comunidad de Madrid. Madrid 2003.
- Sala Lizarraga, José María, "Cogeneración aspectos termodinámicos, tecnológicos y económicos", Bilbao Universidad del País Vasco D.L. 1999
- Smith, Robin, Chemical Process. Design and Integration. Editorial Wiley, 2005.